SOLARGENIX ENERGY
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Distributed Energy Resources Road Show

"Solar Thermal"

May 1, 2003
Chicago Center for Green Technologies

Presented by:
Bill Guiney

What's going on in the Solar Business?

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THE NATURAL POWER FOR GOOD

Solargenix Energy
Primary Markets

- Buildings (Power Roof™)
- Solar Water Heating
- Solar Air-Conditioning & Heating
- Solar Electric Generating Systems(SEGS)

Solar Thermal Technologies

High Temperature

Mid Temperature

Low Temperature

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Advances in Solar Water Heating

LESSONS LEARNED FROM LARGE SCALE SOLAR POWER PLANTS

- Advanced Non-Imaging Optics
- Design and fabrication techniques
- Sophisticated absorber coatings
- Reliability of components
- Low cost maintenance
- Environmental consciousness

SCIENCE TODAY

Revolutionary optics technology intensifies solar power's potential

By Tim Friend
USA TODAY

Say "solar power" and most people think of solar panels they've seen occasionally on the roof of a house.

Now, think again. But think big.

► Rows of glass cylinders glistening on the rooftops of factories, schools and businesses, inexpensively generating heat to power commercial air conditioning units.

► Giant solar furnaces at the local utility drawing energy directly from the sun and powering giant turbines to generate electricity.

► Industrial sun-powered lasers cheaply making chemicals or generating the high temperatures needed to create lightweight, high-tech materials and electronic components.

All are possibilities within a decade with a revolutionary technology called nonimaging optics. Because of its high efficiency and ability to generate extremely hot temperatures, it makes solar energy practical for widespread industrial and commercial use, bringing us closer to the dream of a sun-powered society.

Unlike solar panels, or photovoltaic cells, which convert sun rays to electricity, nonimaging optics converts sunlight to heat and electricity.

To understand nonimaging optics, Roland Winston, chairman of physics, University of Chicago, says to think back to childhood when we used a magnifying glass to burn our initials in a piece of wood. The magnifying glass brings sunlight to a focal point, just as our eyes or camera lens focus light to form an image.

In nonimaging optics, light rays are instead allowed to scramble so no image or focal point is formed. By removing the need to form an image, makes concentrating solar energy much easier and more effective.

"Here's a radically new kind of optical design, which can reach the theoretical limits of solar concentration and can precisely and even surpass the concepts of the sun," Winston

MASTER OF THE SUN: Roland Winston's inspiration — that light rays can be scrambled — led to creation of the compound parabolic concentrator.

Solargenix Energy

Solar Water Heating Division

CPC 2000

Receiver Tube with Non-Imaging Optical Reflector

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2KW SDHW System with20Watt PV Control

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2KW Solar Water Heating System


80-gallon Solar w/LPG heater
Radiant heating
Canada SDHW system
Efland, NC

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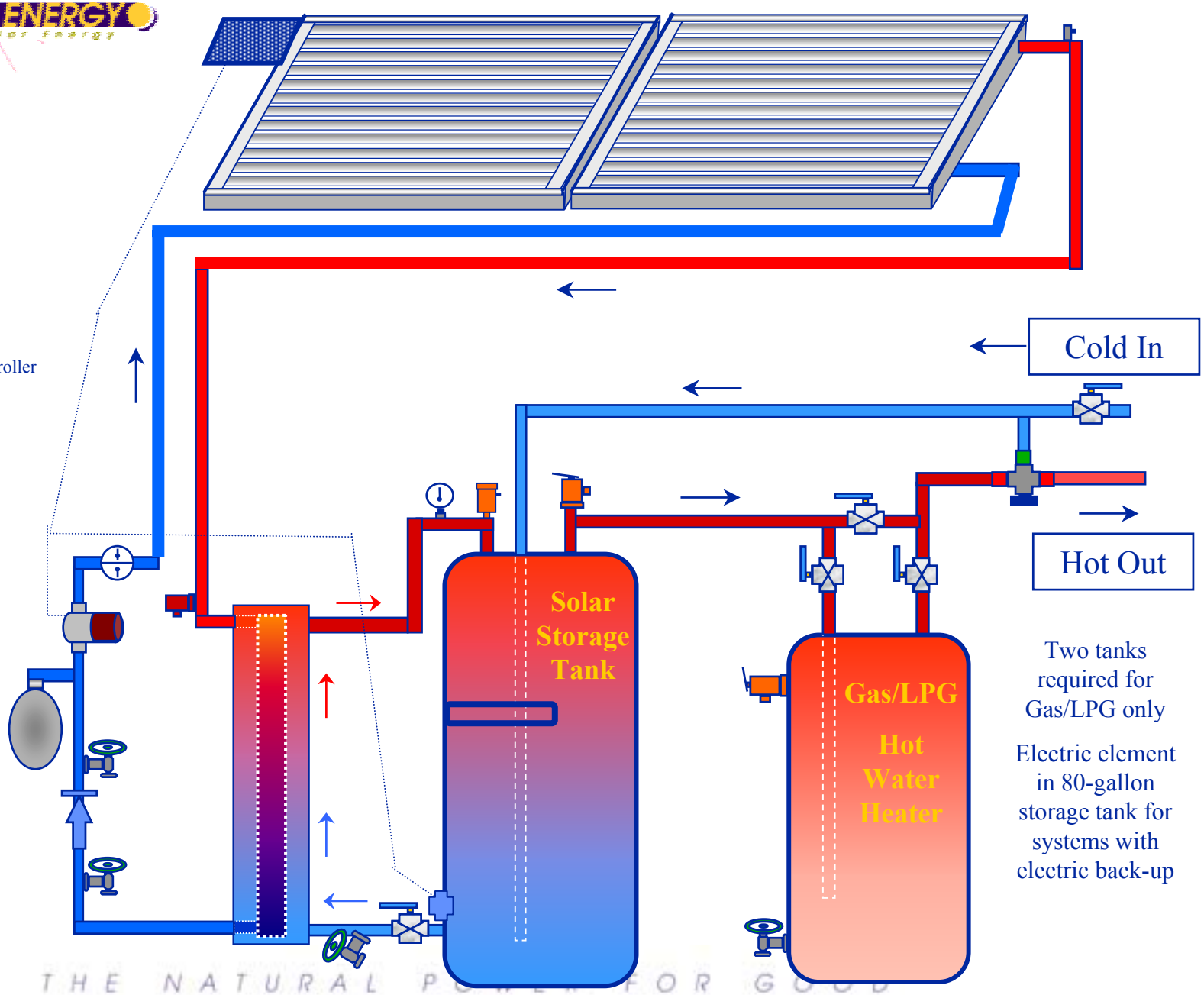
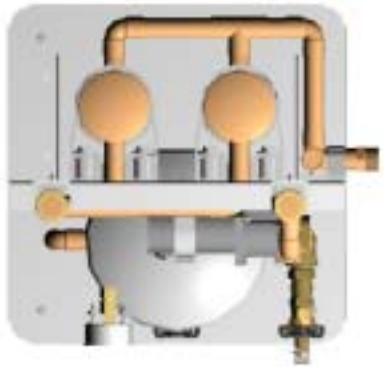
Liz & Rob Pungello - Chapel Hill

2KW 80-Gallon External Heat Exchanger with PV Pump and Control



SOL PAC
Heat Exchanger Module

Front View



Inside views

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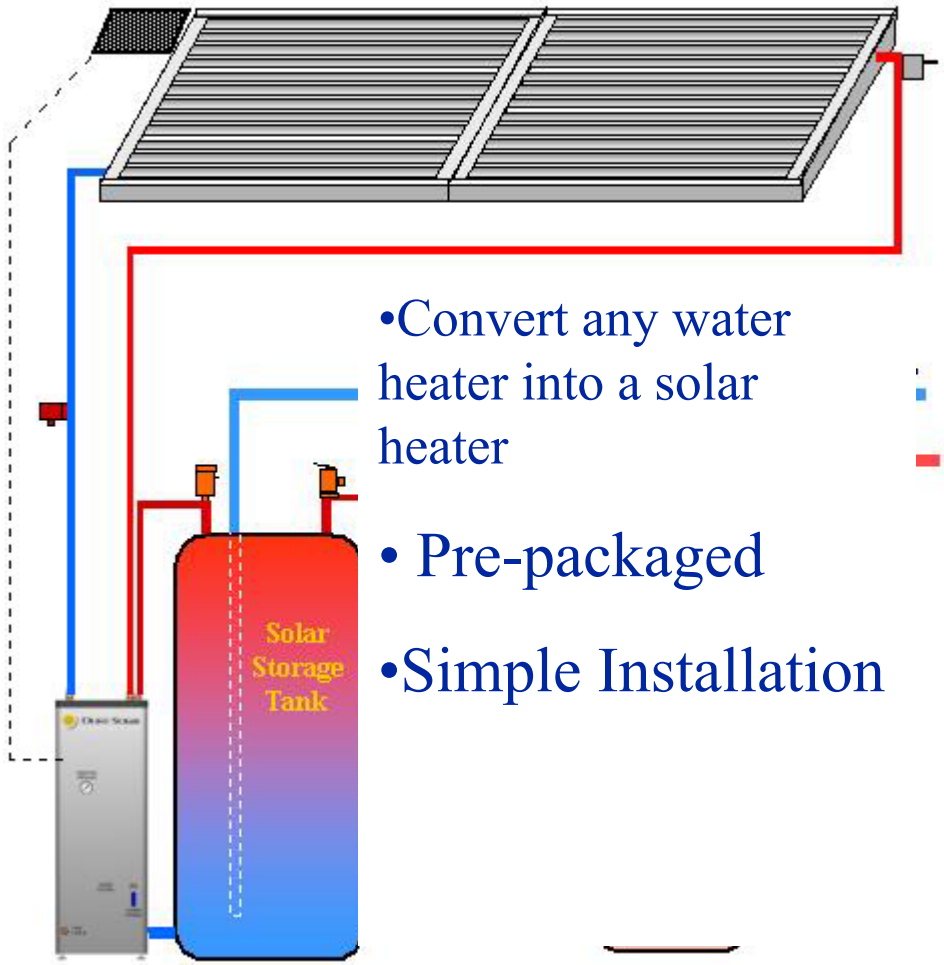
PLUG-N-PLA



- Convert any water heater into a solar heater
- Pre-packaged
- Simple Installation

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Packaged System
"Plug-n-Play"

Freeze proof
Heat Exchanger

Simple to Install
Consumer Friendly

Low cost
Replacement

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Commercial Solar Thermal System

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64 Collector Array
Mixed use Building- NY City

New York City

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Solar Water Heating

Today's best choice

- Code compliance
- Improve Home Energy Rating
- Qualify for Energy Star ™ Homes
- Energy Efficient Mortgage Financing

Water Heating

- **Second largest user of energy**
  - **The higher the EF = lower the cost**
- **Electric - high efficient: EF = .91 +**
- **Gas - high efficient: EF = .58 +**
- **Heat recovery - HRU**
  - **Uses 84% as much energy as an electric**
  - **Minimum code benefit**
- **Solar- higher 1st cost, EF 1.9 to 4+**
  - **Fuel savings = 50% or more**

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Water Heating Systems

5-10 kWh per day savings

Average Savings = ~ 1600 - 3400 kWh/year

@ $0.12/kWh = $200 - $360 0r $16-$30/month

Each system reduces utility peak by ~ .5 KW

Ask About ENERGY STAR

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Solar Heating Options

1. **Service Hot Water**
2. **Space Heating**
3. **Absorption or Adsorption Chiller**
4. **Swimming Pool & Spa**

Water Heating Systems

What do we use?

- Service Hot Water
- Laundry
- Restaurant
- Pool/Spa Heating
- Hospitals/Clinics
- Photo processing
- Space Conditioning
  - Heat or Cool

What is a solar system?

System of Components

- **Heat collection and transfer**
- **Heat storage- vertical or horizontal**
- **Heat delivery- pump or circulator**
- **Freeze protection - (if required)**
- **Controls for active systems**
- **Valves**

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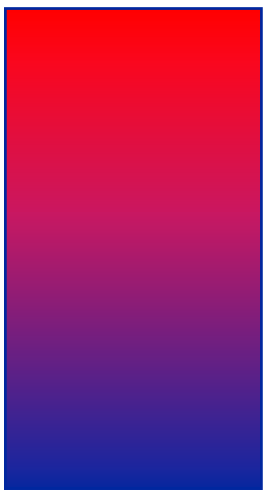
System Types

- **Active System**
  - Collector area
  - Circulator and control
  - Storage tank
- **Passive System**
  - Collector Area
  - Storage tank

System Types

- **Active**
  - **uses a pump**
- **Passive**
  - **does not use a pump - relies on natural forces - "gravity & density"**

Density and Gravity

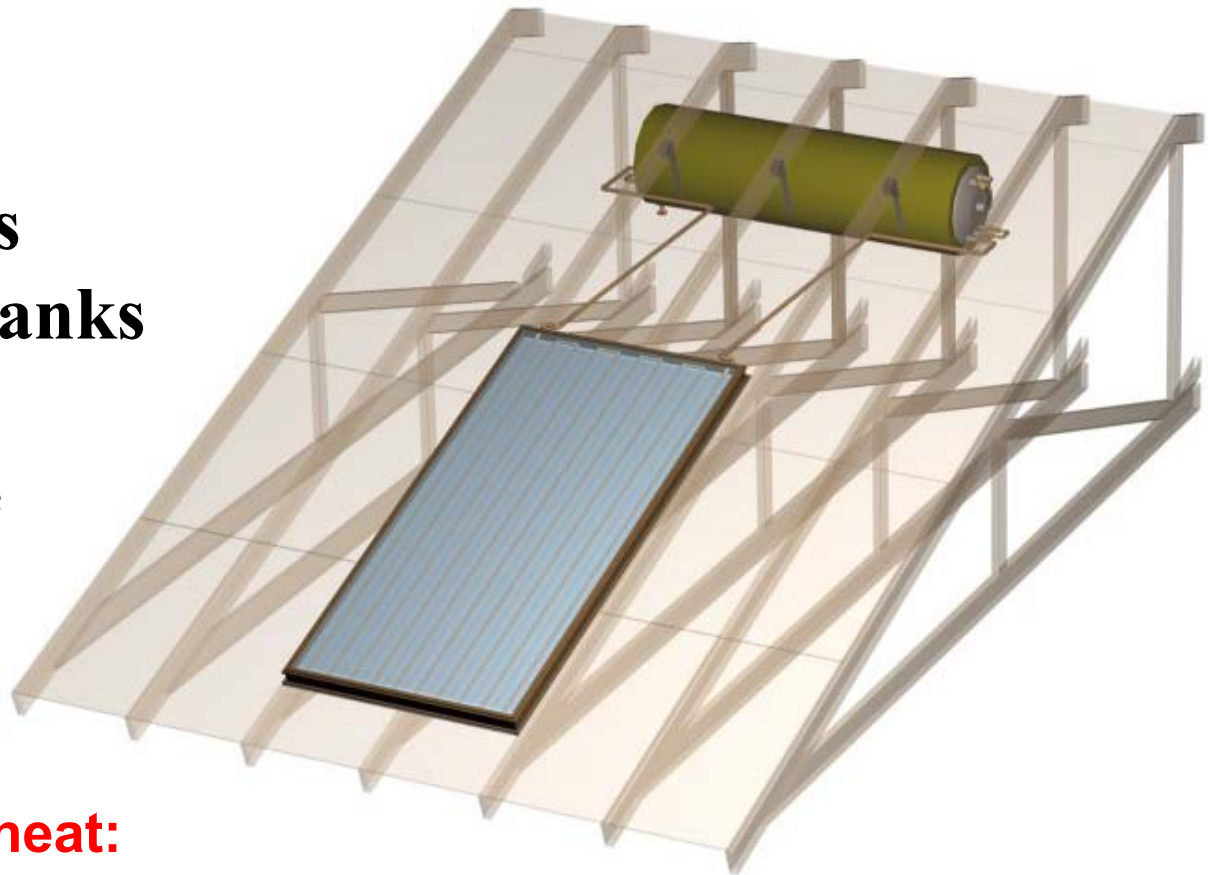


Cold water has more density than hot water.

Cold water is heavier than hot water - gravity pulls the cold to the bottom of the storage tank - pushing hot water up to the top

Technical Advances

- **Pre-Engineered**
- **Passive Designs**
- **No Moving Parts**
- **Stainless Steel Tanks**
- **Easy to Install**
- **No Maintenance**



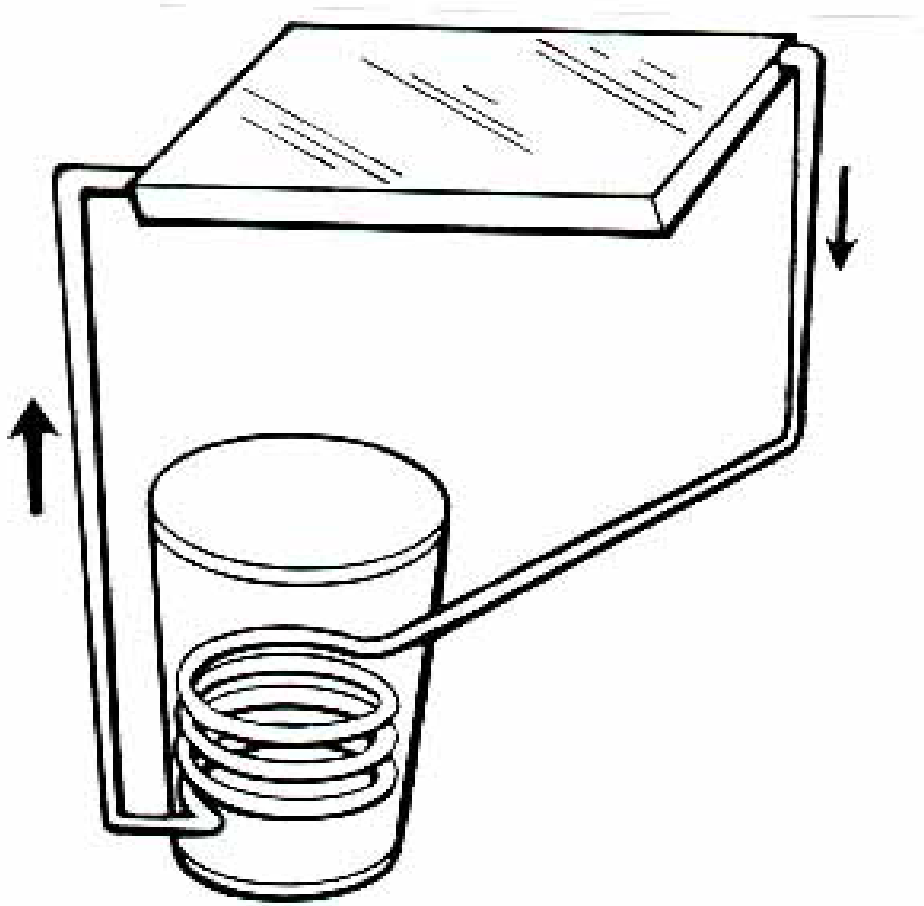
Preheat:
Conventional Gas or Electric Water Heaters
Demand or Tankless Water Heaters

System Types

- **Direct**
  - **city or potable water is circulated from the tank to the collector and back –(Will Freeze in Chicago)**
- **Indirect**
  - **fluid circulating through the collector never comes in contact with the city or potable water in the storage tank**
  - **A heat exchanger is used to transfer heat from the circulating fluid to the potable water**

Indirect System

- **Freeze protection**
- **Reduce Scale**
- **Non-potable fluids**



Indirect System

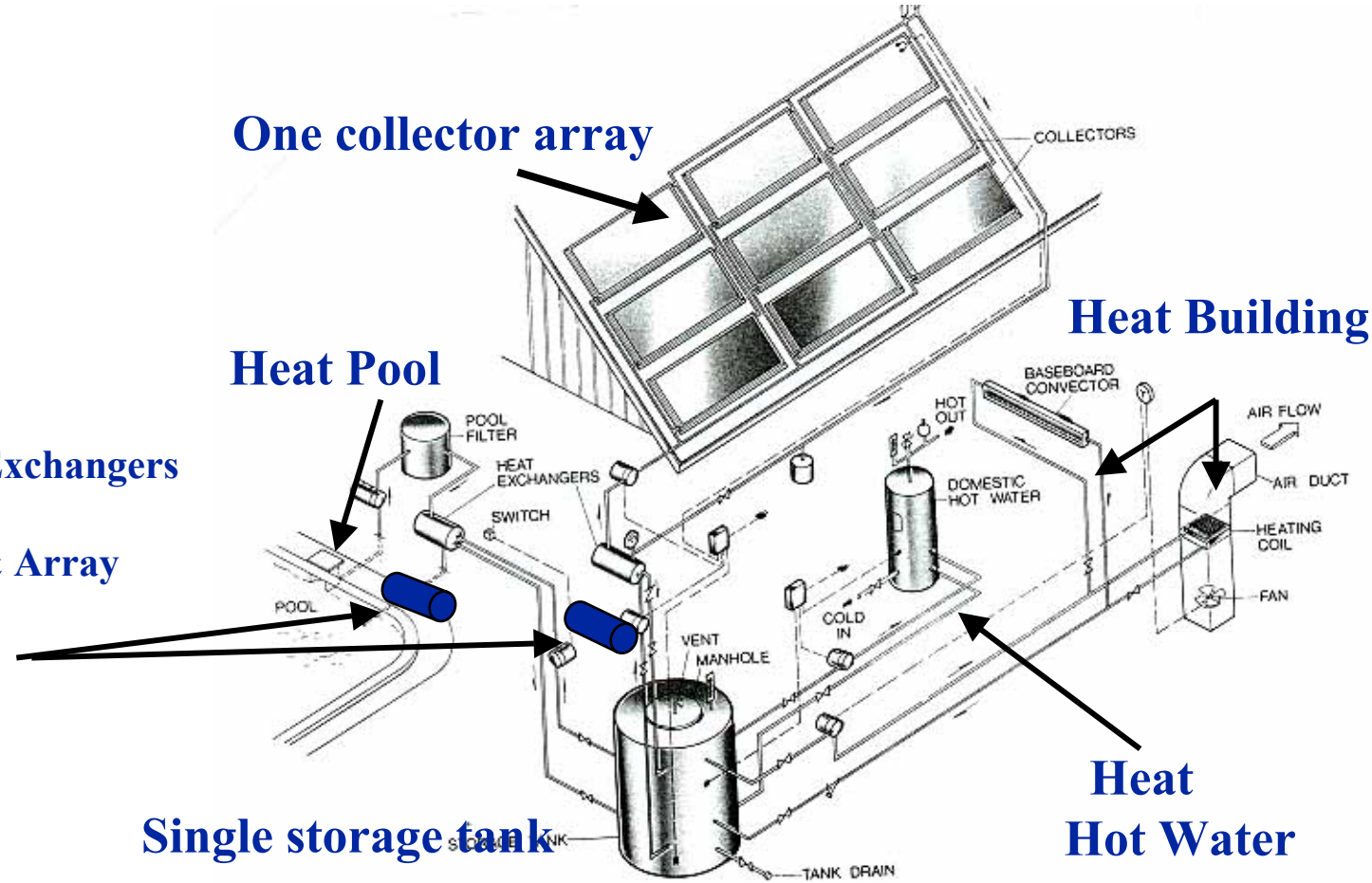
Multi-use system

One collector array

Heat Pool

Heat Exchangers on: Pool & Array

Heat Building



Single storage tank

Heat Hot Water

Solar Water Heating Industry

- **Technical Advances**
  - **High quality materials**
  - **Minimum maintenance**
- **Industry regulation**
  - **Licensed contractors**
  - **Training requirements**
- **System performance testing**

Installation Training

- **Existing Trades**
  - **Plumbers**
  - **Roofers**
- **Local Solar Service Companies**

Authorized Service and Warranty Product

- **Licensed**
- **Insured**
- **Responsive**

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Dealer & Manufacturer Services

Provide Factory Training

- **Marketing & Sales**
- **Management and Associates**
- **Consumer Seminars/Workshops**
- **Installation**
- **Service**

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Energy Star ™ Builder

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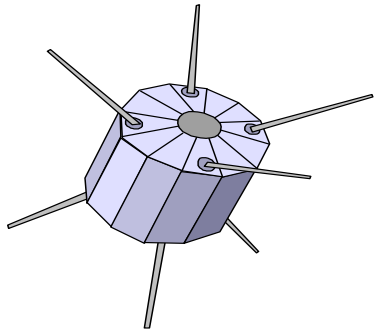
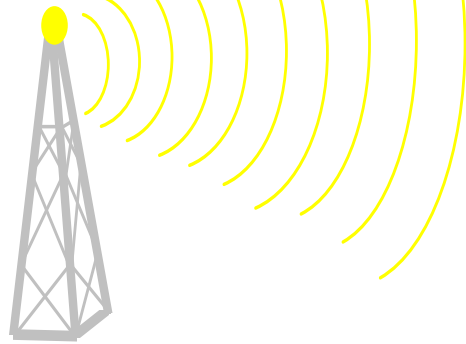
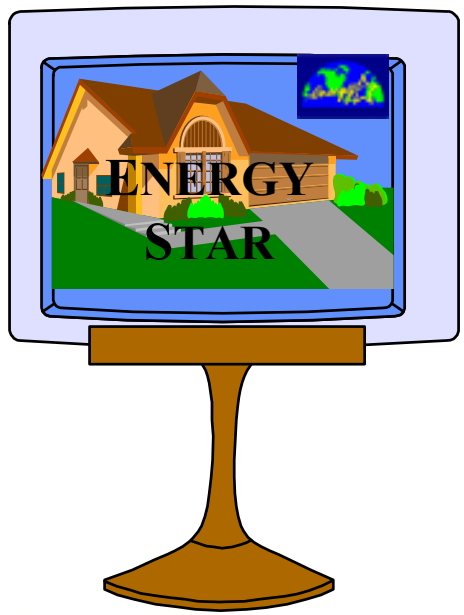
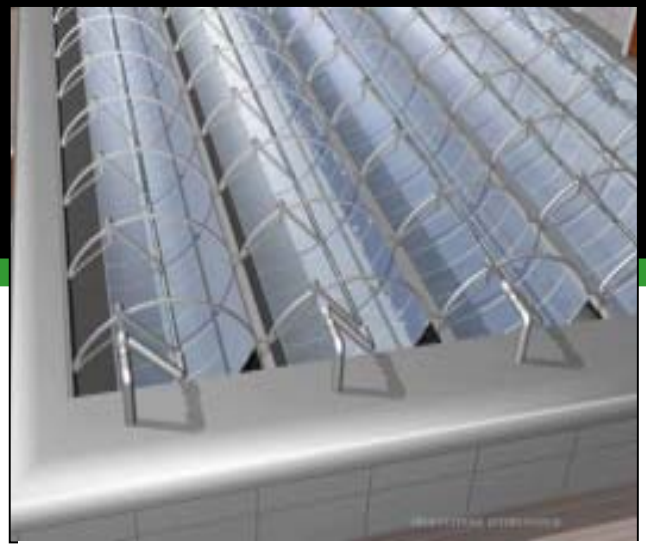
Energy Star ™ Marketing



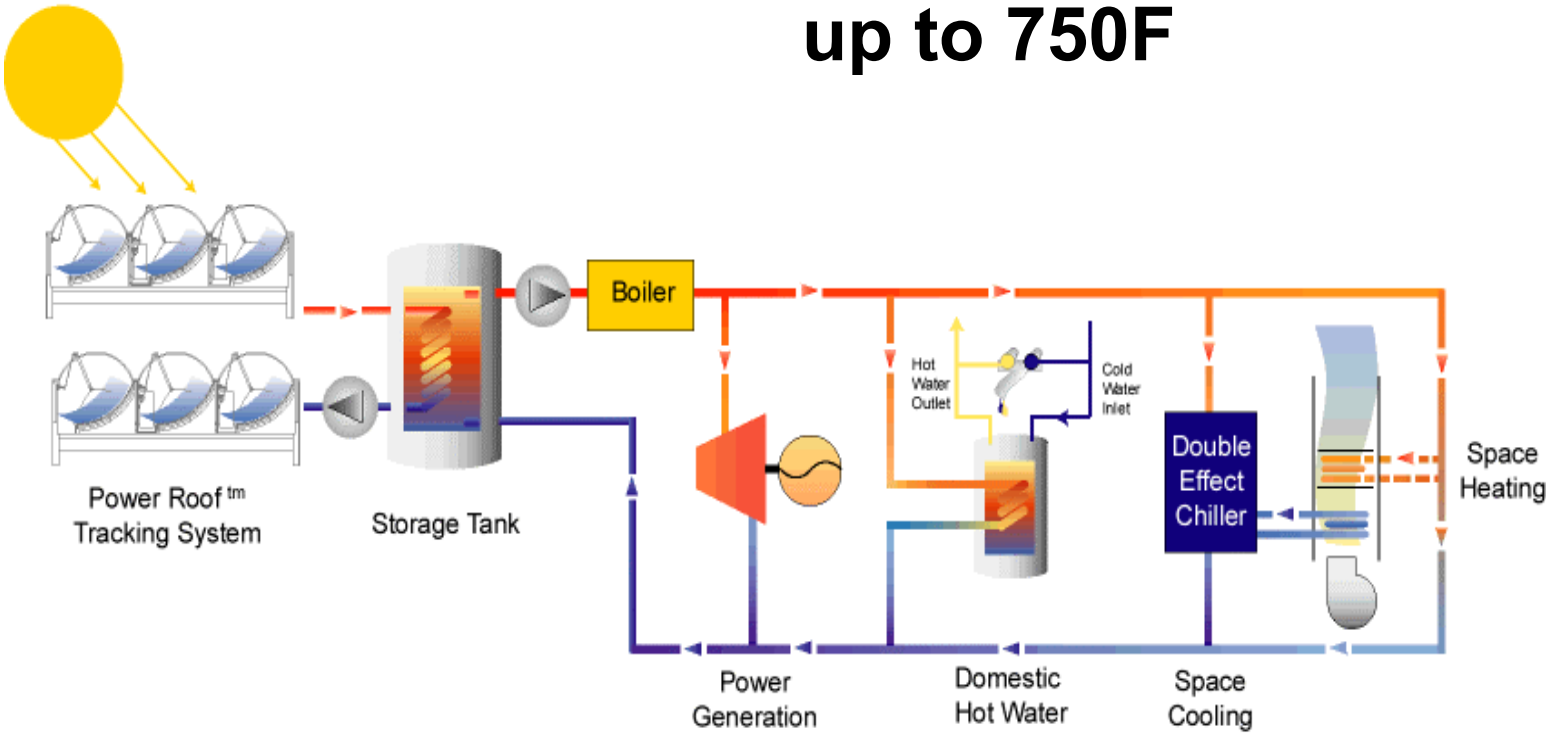






Bundled Energy Systems

- **The Power Roof generates temperatures up to 750F**



Solar Power
Cooling and Heating

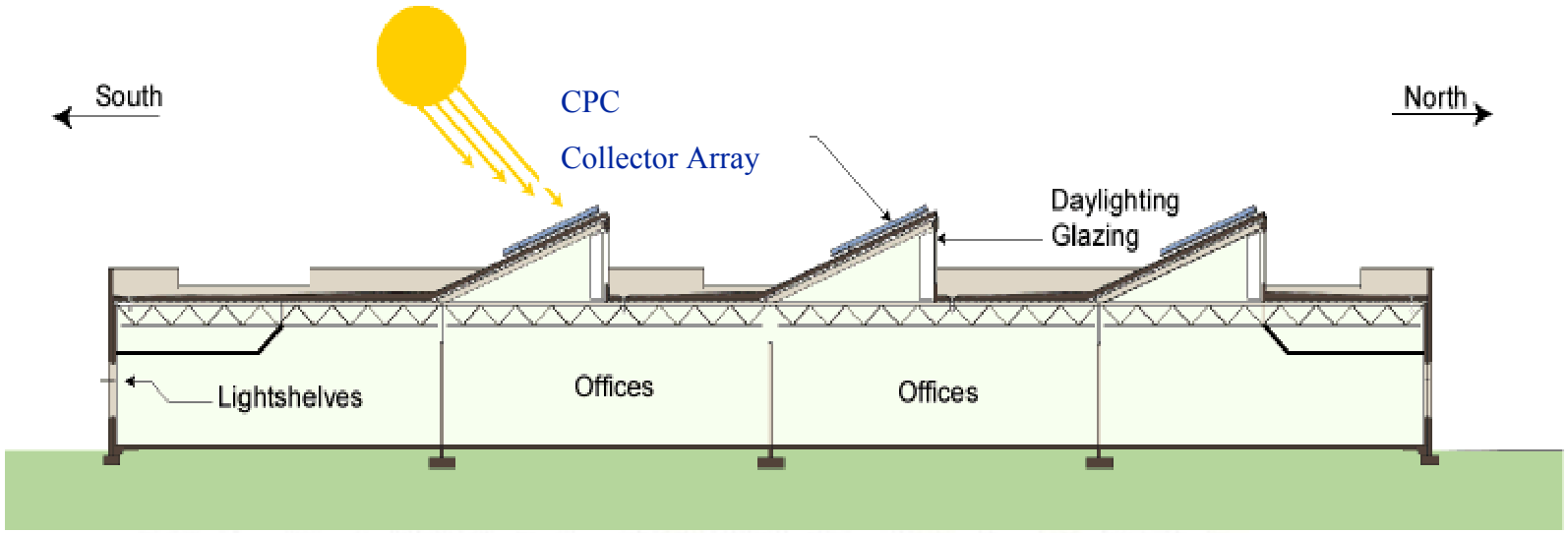
Meeting the needs of the solar Industry with pre-packaged systems providing:

- **High efficiency**
- **Reasonable cost**
- **Good quality**
- **Good appearance**
- **Low maintenance**
- **Easy handling**

Cambar Software Inc.

Charleston, South Carolina

Solargenix Energy's **Power Roof^{tm} system is integrated into the sawtooth roof design, providing solar thermal heating, cooling and daylighting benefits.**



El Dorado Valley- Boulder City, NV
50MW SEGS

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Home Grown Solutions
Proven Technology

Current Projects and Products

50 MW SEGS Nevada NPC/SPPC
1 MW SEGS Arizona Public Service
Multi-Megawatts under development

50-Ton Absorption 2E Chiller- Raleigh, NC
30-Ton Absorption 1E Chiller - Austin, Texas
20-Ton Adsorption 1E Chiller- Charleston, SC

CPC Manufacturing Facility - Chicago, IL
Winston Series CPC Hot Water Collector
SOL PAC Heat Exchanger Module
New Low Cost Passive SDHW system

In a nutshell !

Use the Best Technology
Provide a Complete System (Appliance)
Control the Installation
Finance – Supply & Service the Product
Develop Brand Identity
Simplify the Process

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Thank you!